

CLAIMS

What is claimed is:

- 1 1. A magnetic head, comprising:
2 a magnetoresistive sensor including a ferromagnetic free layer having first and
3 second laterally opposed ends, and
4 an electromagnet having first and second pole ends adjacent said first and second
5 laterally opposed ends of said free layer for biasing a magnetization of said
6 ferromagnetic free layer in a predetermined direction.
- 1 2. A magnetic head as in claim 1, wherein said electromagnet further includes:
2 a magnetic yoke; and
3 an electrically conductive coil formed about a portion of said yoke.
- 1 3. A magnetic head as in claim 2 wherein said yoke is formed with a gap to prevent
2 electrical current from flowing through said yoke from said first pole end to said second
3 pole end.
- 1 4. A magnetic head as in claim 2 further comprising first and second leads formed over
2 said yoke.

1 5. A magnetoresistive sensor as in claim 3, wherein said yoke includes first and second
2 portions separated by said gap and further comprising first and second electrically
3 conductive leads formed over said first and second portions respectively of said yoke.

1 6. A magnetic head, comprising:
2 a magnetoresistive sensor having first and second laterally opposed sides;
3 a first magnetic layer having an end abutting said first side of said
4 magnetoresistive sensor, and extending from said sensor;
5 a second magnetic layer having an end abutting said second side of said
6 magnetoresistive sensor, and extending from said sensor; and
7 an electrically conductive coil formed about a portion of at least one of said first
8 and second magnetic layers.

1 7. A magnetic head as in claim 6, comprising:
2 first and second electrically conductive leads formed over said first and second
3 magnetic layers respectively.

1 8. A magnetic head as in claim 6, wherein said coil comprises:
2 a first set of parallel electrically conductive lines formed at a first elevation;
3 a second set of parallel electrically conductive lines formed at a second elevation;
4 and

5 a set of electrically conductive vias electrically connecting at least a portion of
6 said first electrically conductive lines with said second set of electrically conductive
7 lines.

1 9. A magnetic head comprising:

2 a magnetoresistive sensor having first and second laterally opposed sides;

3 a first front magnetic bias layer having a proximal end abutting said first side of
4 said sensor and having a distal end;

5 a second front magnetic bias layer having a proximal end abutting said second
6 side of said sensor and having a distal end;

7 a back magnetic bias layer having first and second ends;

8 an electrically conductive coil formed about a portion of said back magnetic bias
9 layer;

10 a portion of said first front bias layer overlapping a portion of said back bias
11 layer;

12 a portion of said second bias layer overlapping a portion of said back bias layer;
13 and

14 said first and second front bias layers being electrically isolated from said back
15 bias layer.

1 10. A magnetic head as in claim 9 wherein:

2 said distal end of said first front bias layer overlaps said first end of said back bias
3 layer; and

4 said distal end of said second bias layer overlaps said second end of said back bias
5 layer.

1 11. A magnetic head as in claim 10 further comprising;
2 a dielectric layer disposed between said first bias layer and said first end of said
3 back bias layer; and
4 a dielectric layer disposed between said second bias layer and said second end of
5 said back bias layer.

1 12. A magnetic head as in claim 10 wherein said dielectric layer formed between said
2 first front bias layer and said first end of said back bias layer, and said dielectric
3 layer formed between said second front bias layer and said second end of said back
4 bias layer are each part of a contiguous bias layer.

1 13. A magnetic head as in claim 9 wherein said first and second front bias layers and
2 said back bias layer are formed of a soft magnetic material.

1 14. A magnetic head as in claim 9 wherein said first and second front bias layers and
2 said back bias layer are formed of NiFe.

1 15. A magnetic head as in claim 2, wherein said yoke comprises soft magnetic material;

1 16. A magnetic head as in claim 2, wherein said yoke comprises a material selected from
2 the group consisting of NiFe, FeXN (where X is Al, Ta or Co), CoFe, Sendust, CZT or
3 CZN.

1 17 A magnetic head as in claim 6, wherein said first and second magnetic layers
2 comprise a soft magnetic material.

1 18. A magnetic head as in claim 6, wherein said first and second magnetic layer
2 comprise NiFe

1 19. A magnetic data storage system, comprising:
2 a magnetic disk
3 a motor connected with said disk for rotating said disk;
4 a slider;
5 an actuator connected with said slider for moving said slider relative to said disk;
6 a magnetic head connected with said slider, comprising:
7 a magnetoresistive sensor having first and second laterally opposed sides;
8 a first magnetic layer having an end abutting said first side of said
9 magnetoresistive sensor, and extending from said sensor;
10 a second magnetic layer having an end abutting said second side of said
11 magnetoresistive sensor, and extending from said sensor; and
12 an electrically conductive coil formed about a portion of at least one of
13 said first and second magnetic layers.

1 20. A magnetic data recording system comprising:
2 a magnetic tape;
3 a motor for moving said magnetic tape;
4 a magnetic head mounted adjacent said magnetic tape; said magnetic head
5 comprising:
6 a magnetoresistive sensor having first and second laterally opposed sides;
7 a first magnetic layer having an end abutting said first side of said
8 magnetoresistive sensor, and extending from said sensor;
9 a second magnetic layer having an end abutting said second side of said
10 magnetoresistive sensor, and extending from said sensor; and
11 an electrically conductive coil formed about a portion of at least one of
12 said first and second magnetic layer.